

# THE CONTROL OF TEMPERATURES IN THE PASTEURIZATION OF MILK.

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In the August number (1912) of the AMERICAN JOURNAL OF PUBLIC HEALTH there appeared an article by me dealing with the pasteurization of milk, in which I made suggestions concerning the apparatus to be used for this purpose. In this article, mention was made of a somewhat new method of controlling the temperature to which milk is heated in the pasteurizing plants, which method is not at present in use at any pasteurizing plant so far as I know. I wish to elaborate a little more fully the manner in which this method could be applied to any form of milk heater which is in use at the present time without making changes which would involve any great expense.

There can be no question that the pasteurized milk which is the most desirable, conforms to the following conditions:

First.—The milk should be free from dangerous toxins which may result from the growth of an excessive number of bacteria present in the milk before being pasteurized.

Second.—All pathogenic bacteria should be destroyed and this involves, of course, the destruction of a large percentage of all bacteria contained in the milk.

Third.—The milk should not be subjected to an extremely high temperature since this would result in changing the constituent parts of the milk, give rise to a scorched or cooked taste, and interfere with what is known as the "cream line" when milk is bottled. Such milk would satisfy the demands of health authorities and would also be desirable from the standpoint of the milk dealer.

The point which I wish to emphasize in this article is the control of the temperature to which milk is heated.

The usual method of applying heat to the pasteurizer is either to introduce the steam directly into the heating chamber or to introduce it into the water which flows into the heating chamber. In either case, the chances are very great that some steam will strike the heating surface before it has become condensed and it will therefore cause some portions of the heating surface to become superheated. The milk which strikes these superheated points will be scorched and will impart a scorched taste to the whole body of milk, although the average temperature of the milk leaving the apparatus may be well below the temperature to which it is considered safe to heat it. In the ordinary pasteurizer also, the flow of milk is continuous and uniform, and it is the custom to regulate the temperature of the heated milk



by varying the amount of steam which is introduced into the heating chamber.

In order to prevent superheating, it is desirable that the milk heating apparatus be so constructed that the heated surface with which the milk comes in contact shall never reach a temperature more than 15 degrees F. higher than that at which it is desired that the milk shall leave the apparatus. Since the milk temperature which authorities consider to be the most desirable is 145 degrees F., this means that the heating surface shall never have a temperature higher than 160 degrees F. Several manufacturers of apparatus for pasteurizing milk are now securing this condition by providing a separate tank outside of the milk heater, in which tank water is kept at a uniform temperature of say 160 degrees by means of a thermostat placed in the pipe through which this water is conveyed to the heater and controlling the flow of steam into the water tank. This heated water is then pumped through the milk heater. The greatest milk heating efficiency is obtained from hot water when it is moving rapidly through the heater and back to the water tank, in which case it will lose not over 5 degrees in temperature when returning to the tank.

So far so good.

The problem now presents itself of preventing the milk from falling below the desired temperature of 145 degrees F. when leaving the heater. Such a fall in temperature may result either from the milk being forced too rapidly through the heater and thus being discharged before it has time to take up sufficient heat from the hot water, or it may occur when the temperature of the inflowing cold milk suddenly drops below the usual point. This frequently happens when milk is received from farmers whose methods of cooling milk are not uniform.

When the water in a heating tank is kept at a uniform temperature by means of a thermostat, two methods are open for preventing the milk from dropping below the minimum temperature required. One of these methods is to so increase the heating surface in the milk heater that there will be such a wide margin of safety that no variation in the rapidity of milk flow and no variation in the temperature of the inflowing cold milk can be sufficiently great to cause the heated milk to fall very low in temperature. So far as I know, this is the only method now employed by any manufacturer of pasteurizing apparatus. This method, however, has this disadvantage that the largely increased heating surface requires a great deal of extra labor in cleaning the apparatus, and there is also the added increased danger from the leakage of the water into the milk when pipes are used which are liable to break. There is, however, another method open for controlling the temperature, namely, by attaching a thermostat to the outlet pipe through which the hot milk leaves the



heater, this thermostat to control the flow of the cold milk into the apparatus.

It is evident that when the rapidity of flow is checked more heat will be taken up by the milk in its passage through the heater.

The accompanying cuts illustrate the method here described.

Figure 1 shows the arrangement of this device when the milk flows by gravity into the heater. The thermostat M controls the valve N located in the pipe through which the cold milk flows to the heater.

Figure 2 shows the arrangement of the device when the milk is pumped through the heater by means of a steam pump. In this case, thermostat M controls the valve P, regulating the steam which operates the pump, causing it to increase and decrease its speed. This in turn, of course, controls the flow of milk into the apparatus.

It is very probable that the idea here involved is patentable, but I have no desire to take any advantage of this fact. I have in the last year suggested this new method of control to many manufacturers and milk dealers and I now desire to make it known in a more public way, hoping that some interested party will make use of the idea which appears to be sound in theory and practical to use and should secure automatically a uniform temperature in the milk.